

WHAT IS CLAIMED IS:

- 1 1. An apparatus comprising:
2 a metal alloy surface in contact with a liquid phosphorous precursor
3 compound;
4 said metal alloy having less than 5% nickel.
- 1 2. The apparatus of claim 1 wherein said metal alloy is a stainless steel
2 alloy with at least 15% chromium.
- 1 3. The apparatus of claim 1 wherein said metal alloy is stainless steel
2 having less than 1% nickel.
- 1 4. The apparatus of claim 1 wherein said metal alloy is one of stainless
2 steel alloys 430, 440 and 446.
- 1 5. The apparatus of claim 1 wherein said phosphorous precursor
2 compound is TEPO, TMP or TEP.
- 1 6. The apparatus of claim 1 wherein said phosphorous precursor is TMP.
- 1 7. The apparatus of claim 1 wherein said phosphorous precursor
2 compound is TEP.
- 1 8. An apparatus for delivering a liquid phosphorous precursor compound,
2 comprising:
3 a container for holding said liquid phosphorous precursor
4 compound;
5 a conduit for delivering said liquid phosphorous precursor
6 compound or a gaseous product of said liquid phosphorous precursor
7 compound;
8 a heating surface coupled to at least one of said container and a
9 portion of said conduit;

10 wherein at least a portion of said container or said conduit is
11 composed of an alloy having less than 5 percent nickel.

1 9. The apparatus of claim 8 wherein said metal alloy is a stainless steel
2 alloy with at least 15% chromium.

1 10. The apparatus of claim 8 wherein said metal alloy is stainless steel
2 having less than 1% nickel.

1 11. The apparatus of claim 8 wherein said metal alloy is one of stainless
2 steel alloys 430, 440 and 446.

1 12. The apparatus of claim 8 further comprising a heater for heating said
2 heating surface to a temperature of 160-170 degrees Celsius.

1 13. The apparatus of claim 8 wherein said apparatus is a bubbler system
2 for delivering gases to a chemical reaction chamber for semiconductor wafers.

1 14. The apparatus of claim 8 wherein said apparatus is a boiler system for
2 delivering gases to a chemical reaction chamber for semiconductor wafers.

1 15. The apparatus of claim 8 wherein said apparatus is an injection system
2 for delivering gases to a chemical reaction chamber for semiconductor wafers, and
3 wherein said portion composed of an alloy is an injection valve.

1 16. The apparatus of claim 8 wherein said portion composed of an alloy is
2 one of a gasket and a seal.

1 17. The apparatus of claim 8 wherein said phosphorous precursor
2 compound is TEPO, TMP or TEP.

1 18. The apparatus of claim 8 wherein said phosphorous precursor is TMP.

7 a liquid TEPO, TMP or TEP injection line coupling said container
8 to said injection valve;
9 a carrier gas source line coupled to said injection valve; and
10 an outlet line coupling said injection valve to said CVD chamber.

1 27. The system of claim 26 wherein said stainless steel alloy is one of
2 stainless steel alloys 430, 440 and 446.

1 28. A method for injecting gaseous phosphorous precursor into a CVD
2 chamber comprising the steps of:

3 providing a liquid TEPO, TMP or TEP through an injection valve
4 including a metal alloy having less than 10% nickel;
5 providing a carrier gas through said valve;
6 creating a pressure differential in said valve; and
7 heating said injection valve.

1 29. The method of claim 28 further comprising the step of heating said
2 valve to a temperature of 160-170 degrees Celsius.

1 30. The method of claim 29 wherein said valve is heated to approximately
2 165 degrees Celsius.

1 31. An apparatus comprising:

2 a sealer in contact with a liquid phosphorous precursor compound;
3 said sealer being a polyamide.

1 32. The apparatus of claim 31 wherein said phosphorous precursor
2 compound is one of TEPO, TMP or TEP.

1 33. The apparatus of claim 31 wherein said sealer is a shut-off or control
2 plug in a valve.

1 34. The apparatus of claim 31 wherein said sealer is a gasket.

1 19. The apparatus of claim 8 wherein said phosphorous precursor
2 compound is TEP.

1 20. A liquid flow injection valve for supplying TEPO, TMP or TEP to a
2 chemical vapor deposition (CVD) chamber comprising:

3 an injection orifice for connecting to a source of liquid TEPO,
4 TMP or TEP; and

5 a valve outlet for delivering a gaseous mixture generated from said
6 liquid TEPO, TMP or TEP to said CVD chamber;

7 said injection orifice including a metal alloy having less than 5 %
8 nickel.

1 21. The valve of claim 20 wherein said metal is a stainless steel alloy with
2 at least 15 % chromium.

1 22. The valve of claim 20 wherein said metal is one of stainless steel
2 alloys 430, 440 and 446.

1 23. The valve of claim 20 further comprising a heater for heating said
2 valve to a temperature of 160-170 degrees Celsius.

1 24. The valve of claim 20 further comprising a plug in said valve
2 composed of a polyamide.

1 25. The valve of claim 24 wherein said polyamide is Vespel.

1 26. A liquid injection system for a CVD chamber comprising:

2 a container for holding liquid TEPO, TMP or TEP;

3 an injection valve for converting said liquid TEPO, TMP or TEP
4 into gaseous form, said injection valve having portions in contact with said
5 liquid TEPO, TMP or TEP composed of a stainless steel alloy having less
6 than 5 % nickel and at least 15 % chromium;

1 35. An apparatus for delivering a liquid phosphorous precursor
2 compound, comprising:

3 a container for holding said liquid phosphorous precursor
4 compound;

5 a conduit for delivering said liquid phosphorous precursor
6 compound or a gaseous product of said liquid phosphorous precursor
7 compound;

8 wherein at least a portion of said container or said conduit includes
9 a sealer composed of a polyamide.

1 36. The apparatus of claim 35 wherein said sealer is a shut-off or control
2 plug in a valve.

1 37. The apparatus of claim 35 wherein said polyamide is Vespel.

1 38. The apparatus of claim 35 wherein said apparatus is a bubbler system
2 for delivering gases to a chemical reaction chamber for semiconductor wafers.

1 39. The apparatus of claim 35 wherein said apparatus is a boiler system
2 for delivering gases to a chemical reaction chamber for semiconductor wafers.

1 40. The apparatus of claim 35 wherein said apparatus is an injection
2 system for delivering gases to a chemical reaction chamber for semiconductor wafers,
3 and wherein said sealer is a plug in an injection valve.

1 41. The apparatus of claim 35 wherein said sealer is a gasket.

2
3 42. The apparatus of claim 35 wherein said phosphorous precursor
4 compound is one of TEPO, TMP or TEP.

1 43. The apparatus of claim 35 wherein a portion of said container or said
2 conduit is composed of a stainless steel alloy having less than 5% nickel.

1 44. An liquid flow injection valve for supplying a liquid phosphorous
2 precursor source to a chemical vapor deposition (CVD) chamber comprising:

3 a container of said liquid phosphorous precursor, said liquid
4 phosphorous precursor being one of TEPO, TMP or TEP:

5 an injection orifice for connecting to said container; and

6 a valve outlet for delivering a gaseous mixture generated from said
7 liquid phosphorous precursor compound to said CVD chamber;

8 a shut-off or control plug in said valve, said plug being composed
9 of Vespel.

1 45. A liquid injection system for a CVD chamber comprising:

2 a container for holding liquid phosphorous precursor compound,
3 said liquid phosphorous precursor compound being one of TEPO, TMP or
4 TEP;

5 an injection valve for converting said liquid phosphorous precursor
6 into gaseous form, said injection valve having portions in contact with said
7 liquid phosphorous precursor compound composed of a stainless steel alloy
8 having less than 5% nickel and at least 15% chromium;

9 a shut-off or control plug in said injection valve, said plug being
10 composed of a polyamide;

11 a liquid phosphorous precursor compound injection line coupling
12 said container to said injection valve;

13 a carrier gas source line coupled to said injection valve; and

14 an outlet line coupling said injection valve to said CVD chamber.